

fissures rarely question mark shaped. Transapical striae broad, closely spaced, radiate in mid-valve becoming parallel to weakly convergent near valve apices, 4–7 in 10 μm . Striae rarely distantly spaced. Interstriae of equal or narrower width than striae, rarely wider.

Distribution: *Pinnularia rabenhorstii* var. *franconica* was observed on Pelister and Šar Planina mountains and in the region of Mariovo. On Mt. Pelister this species was found as epiphytic on mosses from the temporary lake Bolnici I, near glacial Lake Golemo, at an altitude of 2225 m a.s.l. On Mt. Šar Planina *P. rabenhorstii* var. *franconica* was observed on several localities in various habitats, springs, streams and lakes. It was found within the epipelon from the spring of River Pena, at an altitude of ca. 2500 m a.s.l. It was also observed as an epiphyte on the macrophyte vegetation from a stream above glacial Lake Crno (ca. 2200 m a.s.l.). Lake Crno is located at an altitude of 2165 m a.s.l. At somewhat higher altitude, this species was observed in a mixed sample of organic sediment and green algal filaments from a small lake near Čardak (ca. 2300 m a.s.l.). The lowest altitude on Mt. Šar Planina where this species was observed is 2185 m a.s.l. of Karanikoličko Lake, where it was found within the epipelon of the lake's sediment at 0.2 m of depth.

This species was additionally observed in the region of Mariovo, central Macedonia. In Mariovo, *P. rabenhorstii* var. *franconica* was found in an aerial habitat, as an epiphyte on the macrophyte vegetation of a temporary wet rock, before the vilage of Dunje.

Observations: *Pinnularia rabenhorstii* var. *franconica* was described from a rivulet near Reichenbach, Germany. Krammer [7] notes this taxon as distributed in oligotrophic waters, frequent within the epipelon. In Macedonia *P. rabenhorstii* var. *franconica* was most abundant as an epiphyte on the moss vegetation from a temporary lake near Lake Golemo on Mt. Pelister, south-western Macedonia.

***Pinnularia idsbensis* sp. nov.**
(Figs 8: 1–12; 11: 14–19)

Description: Valves linear, with consistently parallel margins and unprotracted, broadly rounded apices. Valve length 33.0–71.5 μm , and valve width 11.0–14.0 μm ($n = 35$). Axial area narrow to moderately wide, 1/6 to 1/8 of valve width, linear, expanded near central area. Central area rhombic-lanceolate, 1/2 to 1/3 of valve width or smaller. Central area rarely asymmetrical, mostly well

defined, bordered on each side by 1–3 shortened striae. Raphe weakly lateral, outer raphe fissures linear to weakly curved and inner fissures linear. Proximal raphe endings deflected towards one valve side, terminated with large and distinct, teardrop shaped central pores. Distal raphe fissures sickle-shaped, positioned in prominent terminal areas, clearly discernible in LM. Distal raphe fissures rarely question mark shaped. Transapical striae broad, closely spaced, radiate in mid-valve becoming parallel to weakly convergent near valve apices, 4–6 in 10 μm . Interstriae of equal or narrower width than striae.

Type (here designated): Mountain of Pelister, temporary lake Bolnici I, mosses, collection date: 17 September 2006, leg. A. Pavlov (Accession no. MKNDC 002967). Holotype! Illustrated in Figure 8: 2 (circled specimen on slide MKNDC 002967/D). Slide BRM Zu9/48 (isotype!).

Etymology: The specific epithet ("*idsbensis*") refers to IDSB (Biology Students' Research Society) from Skopje, for the remarkable contribution of its members throughout the last 19 years in biodiversity research and conservation in Macedonia. Even more, a large number of samples in the Macedonian National Diatom Collection (MKNDC) have been collected during the annual sampling campaigns organized by the IDSB.

Distribution: *Pinnularia idsbensis* was observed on Pelister and Šar Planina mountains. It was more abundant on Mt. Pelister, as an epiphyte on mosses from the temporary lake Bolnici I, near glacial Lake Golemo. Lake Bolnici I is a cirque-moraine lake, located at an altitude of 2225 m a.s.l. The basin is filled with water during the period of intensive snow-melt from March till May, with a maximum depth of 0.4 m and average depth 0.3 m. It is only fed by snow-melt and rainfall. *Pinnularia idsbensis* was also found within the epipelon of the same lake. On Mt. Šar Planina this species was also observed as epipellic from the spring of River Pena, located at an altitude of ca. 2500 m a.s.l.

Observations: *Pinnularia idsbensis* is most similar to *P. laterotundata* Van de Vijver & Zidarova [13] in respect to the valve outline, valve size and stria density. The larger valves of *P. idsbensis* have less rounded ends, with the valve margins tapering towards the apices. Furthermore, the transapical striae of *P. idsbensis* are more radiate in mid-valve as compared to the weakly radiate striae of *P. laterotundata*.

Pinnularia laterotundata was described from Byers Peninsula, Livingston Island, Antarctica. Van de Vijver & Zidarova [13] found it quite rare on

Livingston Island with a note that it was also observed on James Ross Island.

***Pinnularia borealis* Ehrenberg var. *borealis* [2]**
(Figs 9: 1–25; 10: 17–25)

Valves linear-elliptic, with weakly convex, rarely parallel, margins and unprotracted rounded apices. Valve length 23.5–43.0 μm , and valve width 7.5–10.5 μm ($n = 65$). Axial area moderately broad, 1/4 to 1/7 of valve width, linear and expanded near central area or lanceolate and gradually widening towards central area. Central area asymmetrical, rhombic-lanceolate to rectangular, 1/2 of valve width or wider. Central area vaguely defined, rarely well defined, bordered on each side by 1–3 shortened striae. Raphe weakly lateral, outer raphe fissures linear to weakly curved, and inner fissures linear. Proximal raphe endings deflected towards one valve side, terminated with distinct, round to tear-drop shaped central pores. Distal raphe fissures sickle-shaped, positioned in small terminal areas, clearly discernible in LM. Transapical striae broad, distantly spaced, radiate in mid-valve becoming parallel to weakly convergent near valve apices, 4–6 in 10 μm . Striae occasionally parallel throughout. Interstriae of equal or greater width than striae.

Distribution: *Pinnularia borealis* var. *borealis* has a wider distribution in Macedonia in comparison to the remaining taxa from the section *Distantes* of the genus *Pinnularia*. It was observed in western Macedonia on Šar Planina and Jablanica mountains, in south-western Macedonia on Mt. Pelister and in the spring area of River Brajčinska, and in central Macedonia near the city of Prilep.

On Mt. Šar Planina *P. borealis* var. *borealis* was found in various habitats, glacial lakes, streams and peat bogs. It was observed as epiphytic on macrophytes from glacial Golemo Karanikoličko Lake, at an altitude of ca. 2300 m a.s.l. At about the same altitude, 2320 m a.s.l., this taxon was found in a mixed sample of organic sediment and green algal filaments from a small lake near Čardak. It was further observed within the epipelon of glacial Lake Crno, located at an altitude of 2165 m a.s.l. and as epiphytic on macrophytes from a stream above Lake Crno at an altitude of about 2200 m a.s.l. On Mt. Jablanica this taxon was observed as an epiphyte on mosses from a peat bog above glacial Lake Podgořečko, at ca. 2000 m a.s.l.

Pinnularia borealis var. *borealis* was found on Mt. Pelister as epiphytic on mosses from the temporary lake Bolnici I near glacial Lake Golemo, at 2225 m a.s.l. It was also observed within the

epipelon of the same lake. This taxon was found as epiphytic on mosses from the spring area of River Brajčinska, the largest tributary to Lake Prespa.

In the central part of Macedonia this taxon was found in a sample from the organic sediment of an old well, nearly 2 m deep, in the village of Zabrčani, near the city of Prilep. This well had been used as a drinking water supply at earlier times.

Observations: The wide distribution of *P. borealis* var. *borealis* was noted earlier, and its occurrence observed in a variety of aerial habitats, as well as in river and lake ecosystems (Krammer [7]). The occurrence of this taxon in a variety of habitats was also observed in Macedonia. The taxonomy around *P. borealis* var. *borealis* is thoroughly explained by Krammer [7].

More recently described *P. sylviae* Van de Vijver in Van de Vijver et al. [14] from Ile Amsterdam does resemble *P. borealis* var. *borealis* in the shape of the valve and the orientation and density of the striae. Nevertheless, the valves of *P. sylviae* are longer ($L = 42\text{--}80 \mu\text{m}$) and the valve apices are slightly tapering, whereas the valve apices in *P. borealis* var. *borealis* are simple rounded.

***Pinnularia borealis* var. *scalaris* (Ehrenberg)**
Rabenhorst [31] (Figs 10: 1–16)

Valves linear to linear-lanceolate, with parallel or weakly convex margins and weakly protracted, rounded apices. Valve length 34.5–51.0 μm , and valve width 8.0–10.0 μm ($n = 45$). Axial area narrow to broad, 1/4 to 1/6 of valve width, linear and expanded near central area or lanceolate and gradually widening towards central area. Central area rhombic-lanceolate to rectangular, 1/2 of valve width or wider, rarely narrower. Central area vaguely defined, bordered on each side by 1–3 shortened striae. Raphe weakly lateral, outer raphe fissures linear to weakly curved, and inner fissures linear. Raphe rarely strongly lateral. Proximal raphe endings deflected towards one valve side, terminated with large and distinct, tear-drop shaped central pores. Distal raphe fissures sickle-shaped, positioned in small terminal areas, clearly discernible in LM. Transapical striae broad, rarely narrow, mostly distantly spaced. Striae radiate in mid-valve becoming parallel to weakly convergent near valve apices, 4–7 in 10 μm . Interstriae of equal or greater width than striae, rarely narrower.

Distribution: *Pinnularia borealis* var. *scalaris* was found on Pelister and Šar Planina mountains and in the region of Mariovo. On Mt. Pelister it was observed as epiphytic on mosses from the temporary lake Bolnici I near glacial Lake

Golemo, at 2225 m a.s.l. On Mt. Šar Planina, *P. borealis* var. *scalaris* was found within the epilimnion of Karanikoličko Lake (2185 m a.s.l.) and Lake Crno (2165 m a.s.l.). It was also observed as an epiphyte on the macrophyte vegetation from a stream above Lake Crno. At somewhat higher altitude, 2320 m a.s.l., this taxon was found in a mixed sample of organic sediment and green algal filaments from a small lake near Čardak, on Mt. Šar Planina. In the region of Mariovo, central Macedonia, *P. borealis* var. *scalaris* was observed as epiphytic on macrophytes from a wet rock before the village of Dunje.

Observations: Longer valves of *P. borealis* var. *scalaris* might be confused with *P. sylviae*, which is described from and restricted in distribution to Ile Amsterdam, southern Indian Ocean (Van de Vijver et al. [14]). A distinction can be made due to the slightly protracted valve apices in *P. borealis* var. *scalaris*. Shorter valves of *P. borealis* var. *scalaris* have more lanceolate valves with weakly convex margins (opposite to the strictly linear valves with parallel margins in *P. sylviae*).

***Pinnularia borealis* var. *islandica* Krammer [7]**
(Figs 11: 1–13)

Valves linear-elliptic, with weakly convex margins and unprotracted, broadly rounded apices. Valve length 25.0–47.5 μm , and valve width 9.5–13.0 μm ($n = 40$). Axial area broad, rarely narrow, 1/4 to 1/6 of valve width, linear and expanded near central area or lanceolate and gradually widening towards central area. Central area large rhombic-lanceolate to lanceolate, 1/2 of valve width or wider, occasionally expanded close to valve margins. Central area mostly well defined, bordered on each side by 1–3 shortened striae. Raphe weakly lateral, outer raphe fissures linear to weakly curved, and inner fissures linear. Proximal raphe endings deflected towards one valve side, terminated with large and distinct, round to tear-drop shaped central pores. Distal raphe fissures sickle-shaped, positioned in prominent terminal areas, clearly discernible in LM. Transapical striae broad, mostly closely spaced, radiate in mid-valve becoming parallel near valve apices, 4–6 in 10 μm . Striae occasionally nearly parallel in mid-valve or distantly spaced. Interstriae of equal or narrower width than striae, rarely wider.

Distribution: *Pinnularia borealis* var. *islandica* was observed on Pelister and Šar Planina mountains and in the region of Mariovo. On Mt. Pelister it was found as an epiphyte on mosses from the temporary lake Bolnici I, located at an altitude

of 2225 m a.s.l. near the glacial Lake Golemo. On Mt. Šar Planina this species was found at slightly higher altitude, ca. 2500 m a.s.l. within the epilimnion of the spring of River Pena. In Mariovo, *P. borealis* var. *islandica* was observed in an aerial habitat, as an epiphyte on the macrophyte vegetation of a wet rock before the village of Dunje.

Observations: *Pinnularia borealis* var. *islandica* was described from Gullfoss, Iceland and is distributed in the subarctic region (Krammer [7]). Most of the valves depicted herein are shorter than the valve length given in the protologue of this taxon. Nevertheless, sufficient characters for a distinction from *P. borealis* var. *islandica* were not observed. We surmise that this taxon has a wider distribution in Europe, but was somehow overlooked or maybe misidentified in the past.

Pinnularia borealis var. *islandica* resembles *P. sylviae* Van de Vijver in Van de Vijver et al. [14] with regard to the orientation and density of the striae and the shape of the valve apices (broadly rounded and unprotracted in both taxa). A distinction can be made due to the shape of the valve (strictly linear with parallel margins in *P. sylviae*) and the axial area (narrow linear in *P. sylviae* compared to broadly linear or lanceolate in *P. borealis* var. *islandica*).

Pinnularia borealis* var. *subislandica
Krammer [7] (Figs 12: 1–27)

Valves linear-lanceolate, with weakly convex margins and not or weakly protracted, truncate apices. Valve length 22.5–42.5 μm , and valve width 7.0–9.0 μm ($n = 60$). Axial area broad, 1/3 to 1/5 of valve width, linear and expanded near central area or lanceolate and gradually widening towards central area. Axial area rarely narrow, 1/8 of valve width. Central area rhombic-lanceolate to rounded, 1/2 of valve width or wider, narrower only in shortest specimens. Central area mostly well defined, bordered on each side by 1–2 shortened striae. Central area occasionally vaguely defined. Raphe weakly lateral, outer raphe fissures linear to weakly curved, and inner fissures linear. Proximal raphe endings deflected towards one valve side, terminated with large and distinct, round to tear-drop shaped central pores. Distal raphe fissures sickle-shaped, positioned in small terminal areas, clearly discernible in LM. Transapical striae broad, rarely narrow, mostly distantly spaced, occasionally closely spaced. Striae radiate in mid-valve becoming parallel to weakly convergent near valve apices, 4–6 in 10 μm . Interstriae of equal or greater width than striae, rarely narrower.